REMARKS

Claims 1 - 67 remain active in this application. No amendments have been made and no new matter has been introduced into the application. The indication of allowability of the subject matter of claims 2, 3, 10, 15, 24, 28, 29, 36, 41, 49, 52 - 54 and 65 - 67 is noted with appreciation.

Claims 1, 4 - 8, 11 - 14, 16 - 23, 25 - 27, 30 - 34, 37 - 40, 42 - 48 50, 51, and 55 - 64 have been rejected under 35 U.S.C. §102 as being anticipated by the Billard et al. article. This sole ground of rejection is respectfully traversed.

While the Examiner's comments in regard to the content of Billard et al. appears to be substantially correct, it is respectfully submitted that, as the Examiner has observed, the sensory feedback of Billard et al. is indicative of the angle of joints and is used to simulate the contraction of biological muscles to achieve the correct/desired angle of joint movement or position which is "tonic" or (as the Examiner has observed) non-oscillatory. See Section 3 of Billard et al., last sentence. However, the Examiner has not demonstrated any disclosure of Billard et al. which teaches use of such feedback to *directly* control or adapt operation of a central pattern generator which produces rhythmic or oscillatory signals and motions.

Specifically, the references in Billard et al. to "gait", mentioned by the Examiner (e.g. Section 1, last sentence) mentions "motor patterns can be modulated by a control signal (the tonic input) for modifying the frequency and the phases of the gaits". However, discussion of the gaits such as walking, trotting and galloping (e.g. page 2, last full paragraph) makes reference to Central Pattern Generators or CPGs but not sensory feedback while the following paragraph modifies tonic input to smooth a sitting (e.g. non-repetitive)

movement.   In regard to the passage bridging pages 4
and 5 of Billard et al., on which the Examiner
evidently relies to support the reference in the
statement of the rejection to smooth transitions
between gaits, the tonic input derived from feedback is
only disclosed as useful for *initiating* locomotion and
the reference in that passage to increasing tonic input
having the effect of "increasing the oscillation
frequency of the networks" contains no reference to any
responsiveness to feedback signals (which apparently
only develop forces necessary to achieve desired joint
angles in Billard et al., as noted above) *to effect any
change or adaptation in the rhythmic patterns developed
by CPGs* as recited in independent claims 1, 27, 55 and
57 and which is implicit in independent claims 52, 64
and 65.

 That is, Billard et al. appears to be indicating
that a change in (non-oscillatory) tonic input (e.g. by
change of *gain* in the feedback path as distinguished
from any change in the feedback signals *per se*) may
result in a change in oscillation frequency as a
function of the CPG networks as part of their
autonomous functioning.   That is, if a change in tonic
input causes a step to be made more forcefully (e.g. so
that the limb achieves a desired angle or position more
rapidly), the CPG will *autonomously* react by causing
the next motion to be performed at and earlier time and
thus continue operation at higher frequency.   It should
also be noted in this regard, that Billard et al.
admits in the last paragraph of section 4 that this
approach is unsuccessful in producing practical
galloping and trotting gaits and that the trotting gait
produced results in slower motion of the robot than
walking due to slippage.   Therefore, it is clear that
the oscillatory motions and control signal patterns in
Billard et al. are not, in fact, *adapted* in response to
sensory feedback but, rather, the CPG merely *reacts* in

frequency and phase of *oscillatory* control signals to changes in control of *non-oscillatory* controls which are only partially based on the feedback sensor output of angular limb position. The change in oscillation frequency observed by Billard et al. is not apparently responsive to any change in the feedback signal, itself, but only a reaction to a change in the non-oscillatory tonic input and the Examiner has not explicitly asserted any direct control of the CPG or adaptation of rhythmic movement control based on a feedback signal by which to demonstrate that Billard et al., in fact, answers the claim recitations in order to demonstrate anticipation and the propriety of the asserted ground of rejection.

Accordingly, it is seen that the Examiner has not made a *prima facie* demonstration of the anticipation of any claim in the application. Simply put, Billard et al. does not disclose adapting CPG operation in any manner which is responsive to output of the sensory feedback which Billard et al. discloses and the Examiner has not demonstrated or even asserted that it does.

In regard to claims 52, 64 and 65, it is also respectfully pointed out that while these claims do not explicitly require adaptation of the rhythmic commands as a function of sensor output (e.g. feedback) as do the other independent claims, claim 52 explicitly recites application of rules to sensory feedback signals for control rhythmic movement, claim 64 explicitly recites "manipulating neural phasic relationships of said pattern of autonomously generated rhythmic output patterns" and claim 65 explicitly recites "rule-application...to the sensory feedback"; none of which are addressed in the Examiner's statement of this sole ground of rejection and none of which are seen to the taught by Billard et al. Therefore none of these claims are anticipated by Billard et al.

Additionally, it is respectfully pointed out that the Examiner has not addressed the recitations of many of the dependent claims included within this ground of rejection. For example, Billard et al. uses a "leaky-integrator" neuron model which has a continuous output while claim 18 explicitly recites am "integrate and fire" neuron having a spiking output. Similarly, claim 21 (and independent claim 27) recite a biological neuron (by which appliances such as prosthetic device and pace-makers may be provided in accordance with the invention for application to animals and/or humans) which is not addressed by either the Examiner or Billard et al.
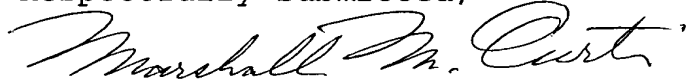
Therefore, it is respectfully submitted that the asserted ground of rejection is clearly in error in failing to consider explicit recitations of the claims and failing to demonstrate how salient explicit recitations of the claims such as adaptation of the commands and rhythmic pattern of commands is response to a feedback signal and that the Examiner has not made and cannot make a *prima facie* demonstration of anticipation of any claim in the application based on Billard et al. Accordingly, it is respectfully requested that the sole ground of rejection in this application be reconsidered and withdrawn.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and/or inapplicable to the present claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

A petition for a one-month extension of time has been made above. If any further extension of time is

required for this response to be considered as being
timely filed, a conditional petition is hereby made for
such extension of time. Please charge any deficiencies
in fees and credit any overpayment of fees to
Attorney's Deposit Account No. 50-2041.

Respectfully submitted,

Marshall M. Curtis
Reg. No. 33,138

Whitham, Curtis & Christofferson, P. C.
11491 Sunset Hills Road, Suite 340
Reston, Virginia 20190

(703) 787-9400
Customer Number: **30743**